ADT PLM

Programmer's Learning Machine

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IJD Seminar, 2016-02-02

Outline

1. Presentation of PLM
   - Purposes
   - Demo
   - About PLM
   - Architecture
2. User's code's assessment
   - Challenges
   - Extraction of the execution component
   - Docker
3. Result
4. Next steps

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Presentation of PLM

Purposes

- Application to learn programming.

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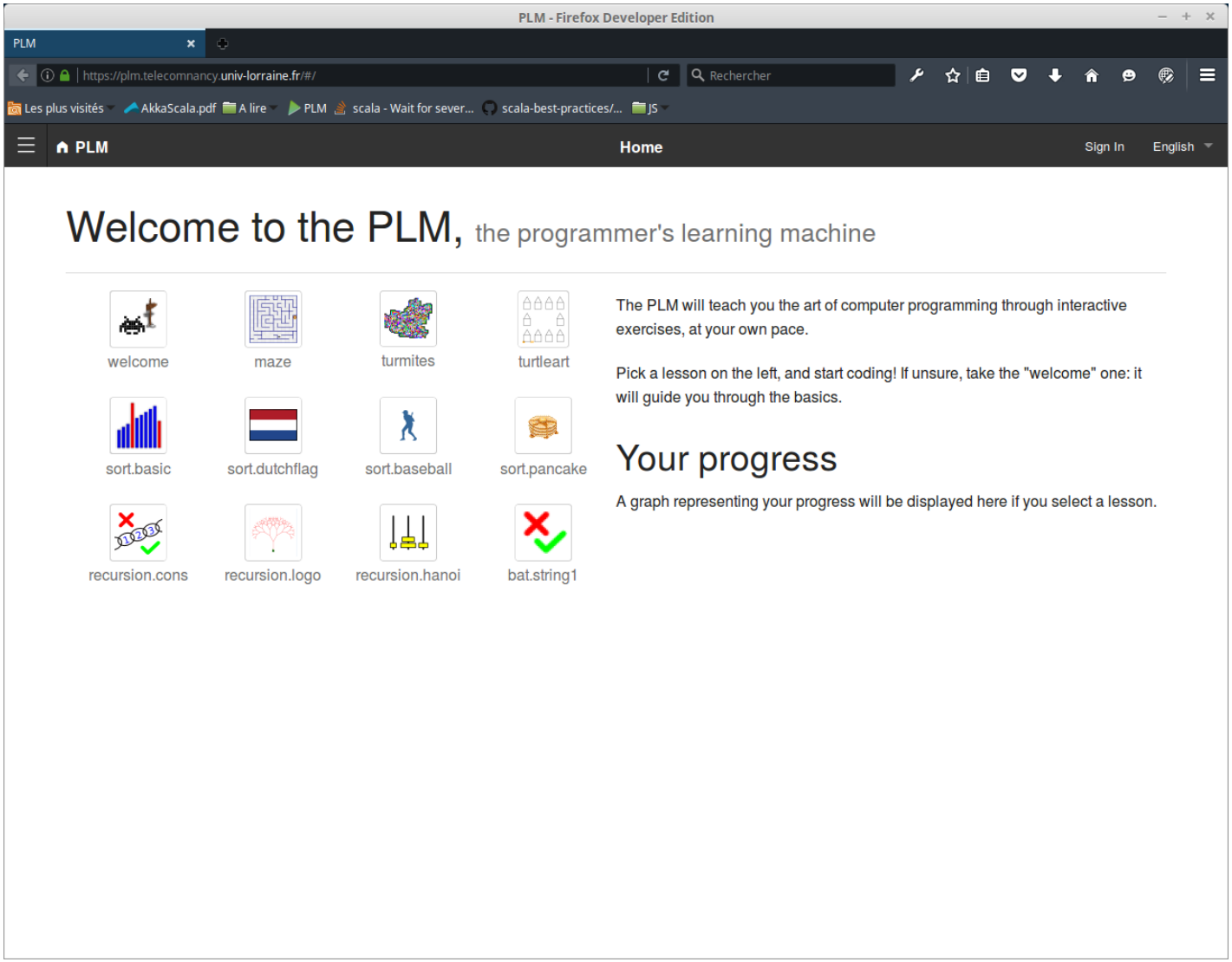
Presentation of PLM

Purposes

- Application to learn programming.
- Allows students to progress at their own speed...
- ... while the teacher helps the ones having trouble.
- Used at TELECOM Nancy since 2008.

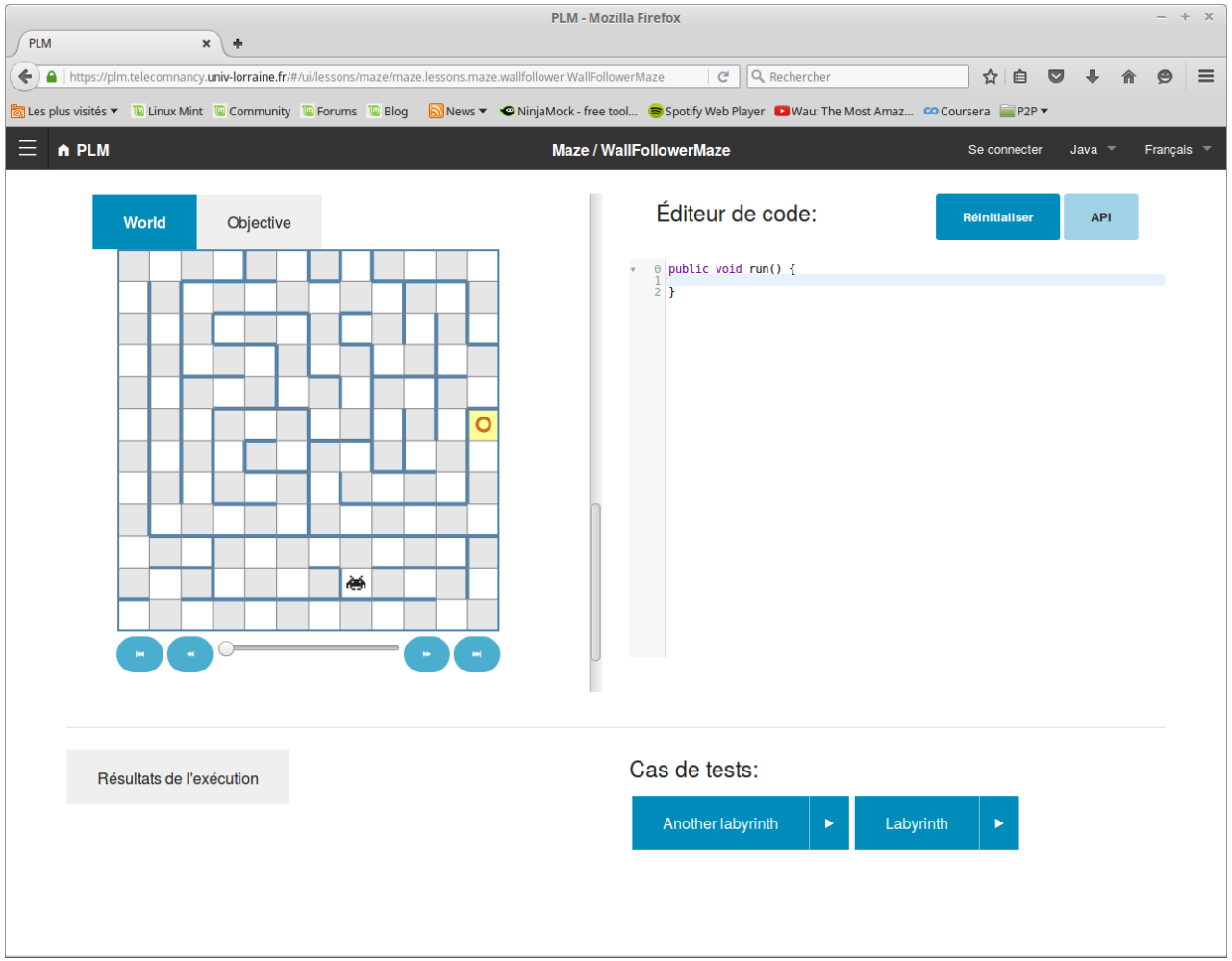
Presentation of PLM

Quick demo



Presentation of PLM

12 lessons, 200 exercises



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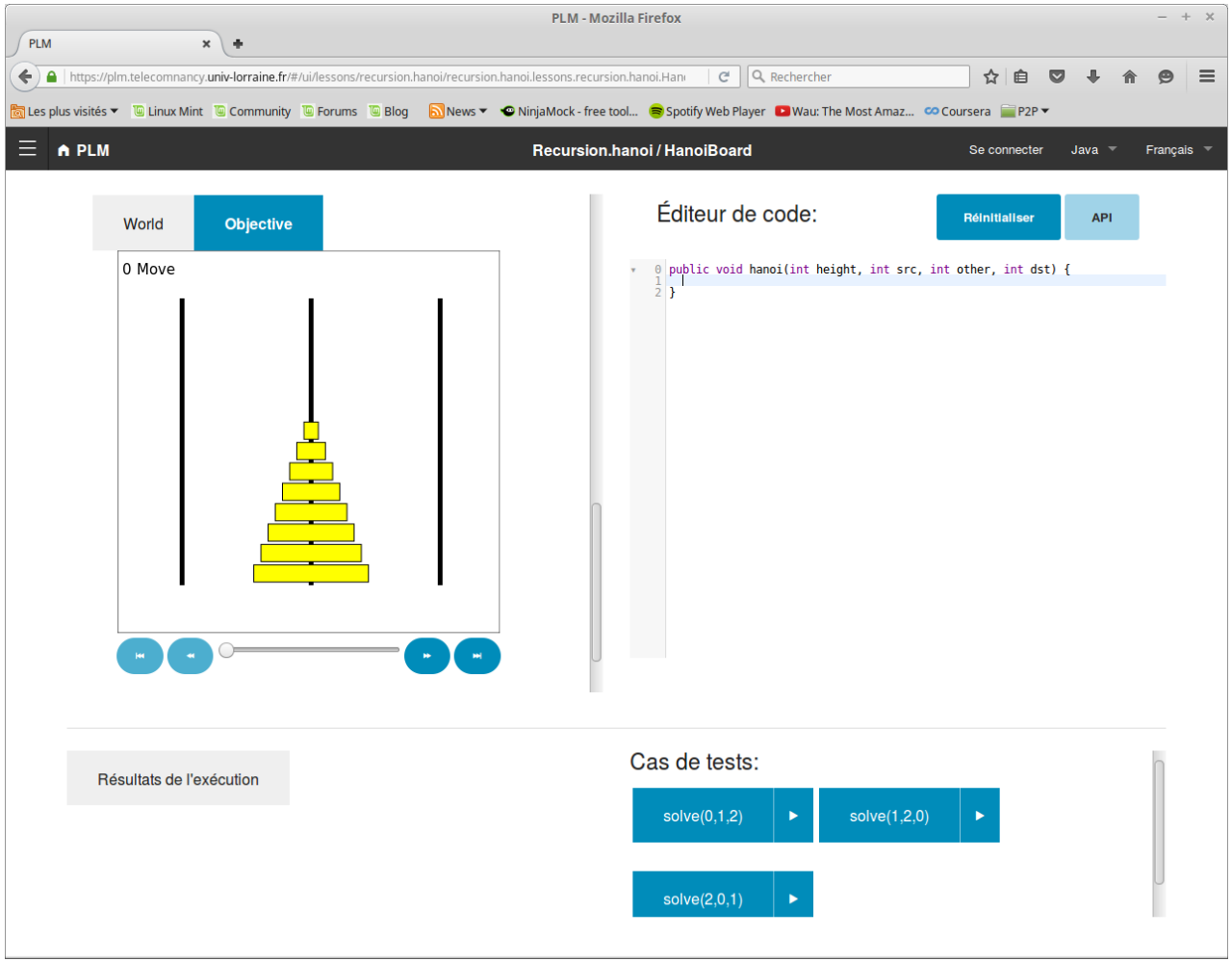

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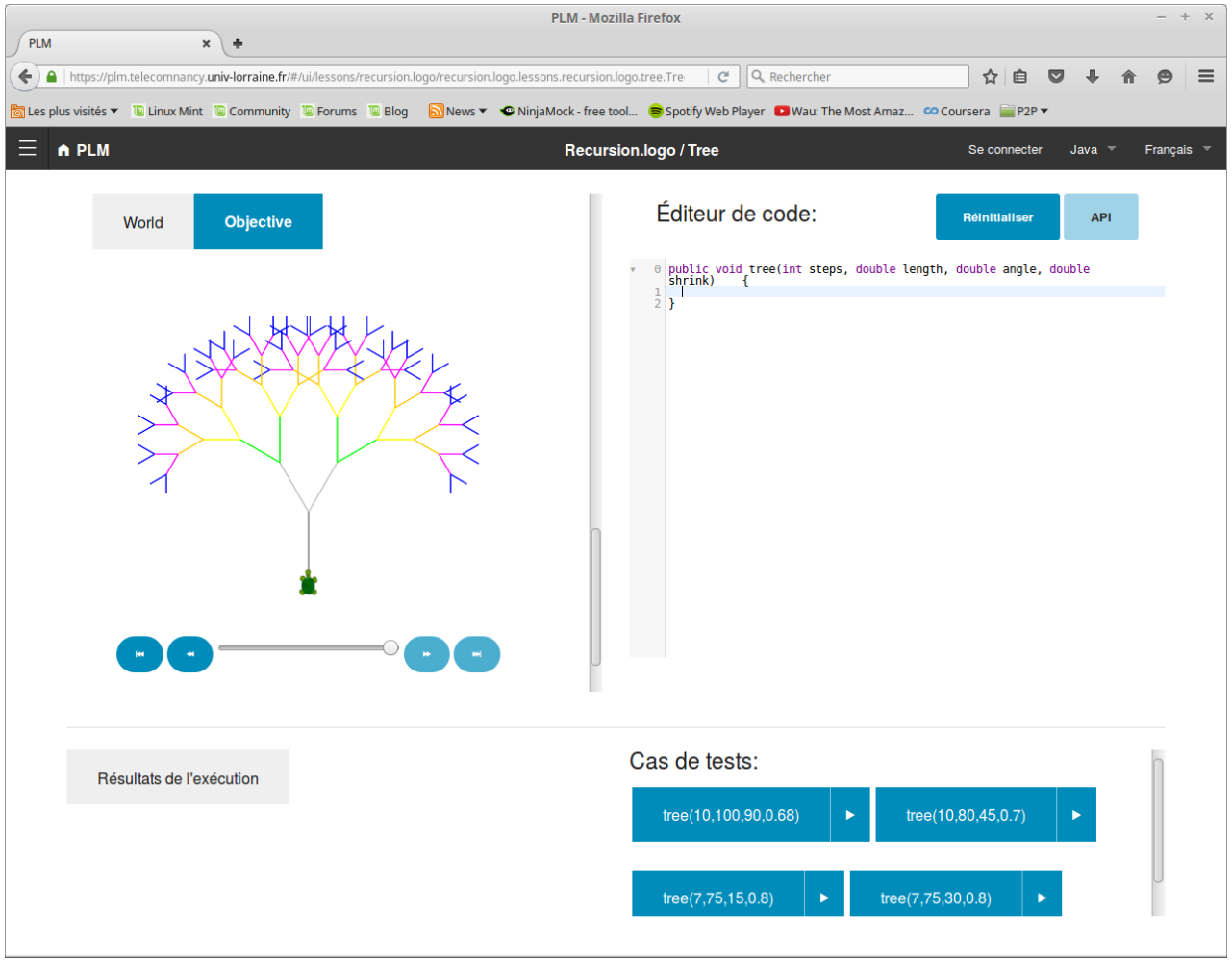

Presentation of PLM

Supported languages

- English
- French
- Brazilian Portuguese

Presentation of PLM

Supported programming languages

- Formerly a fat client
  - Written in Java

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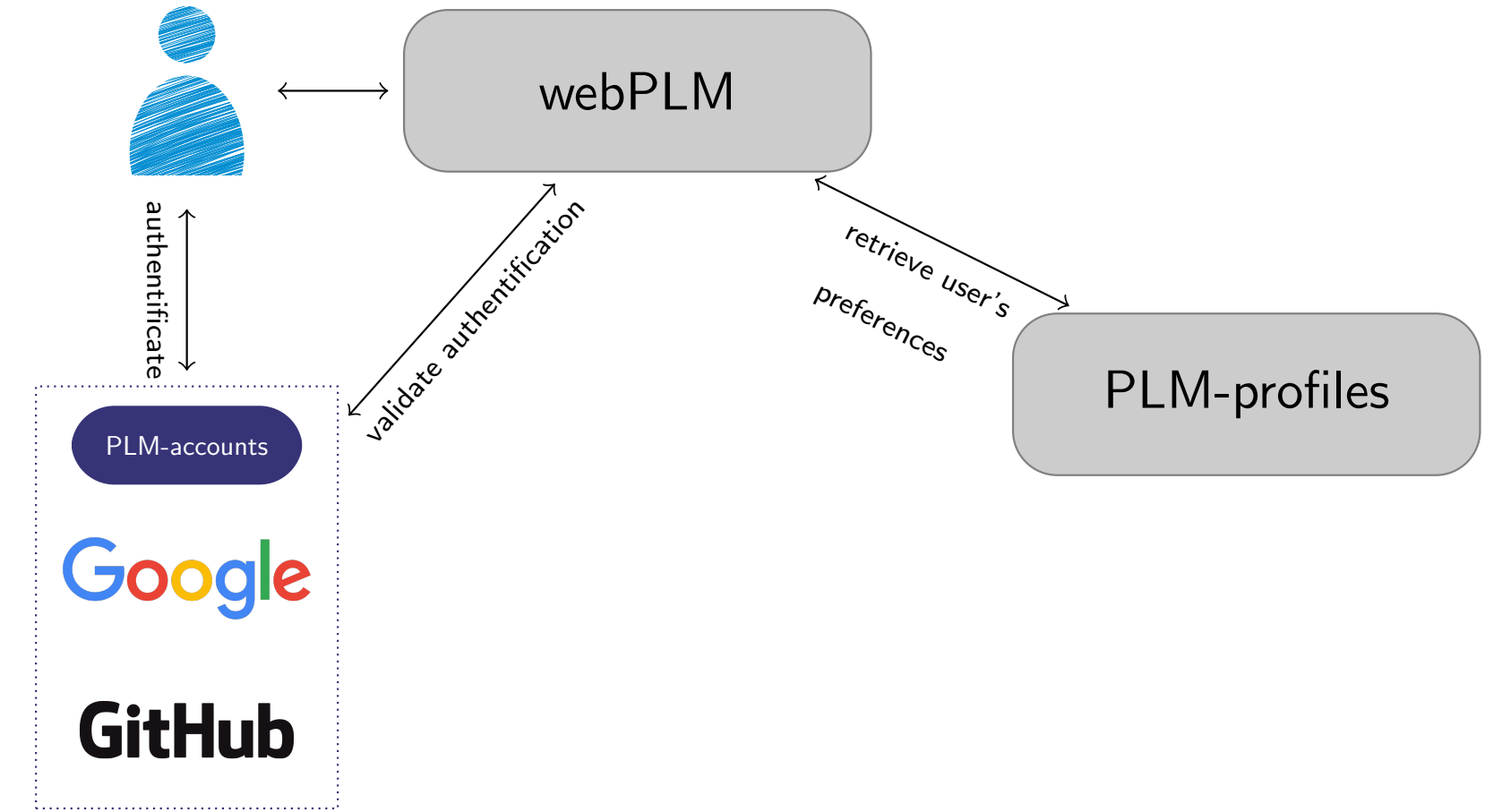
  - Written in Java
- Switch to a web application
  - Server implemented in Scala using PlayFramework
  - User interface written in Javascript using AngularJS and Foundation

Presentation of PLM

Application's architecture



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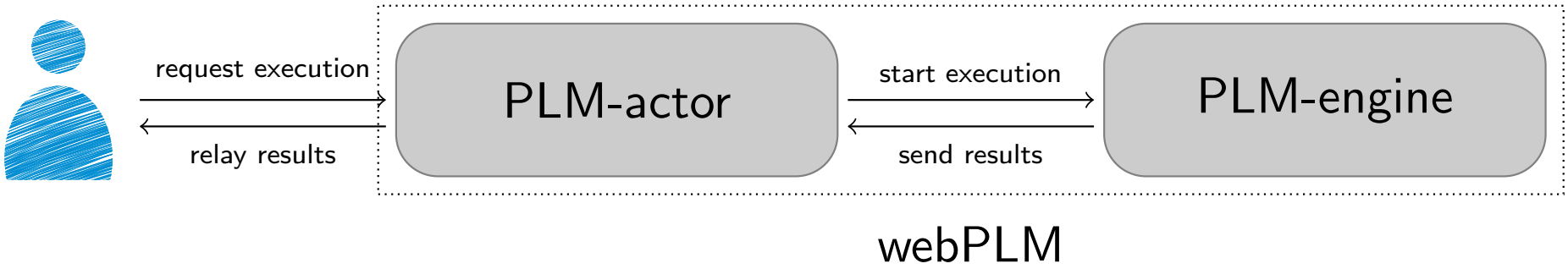
User's code's assessment

Execution components



User's code's assessment

Limits

- Run on the same machine, same JVM

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  - Infinite loops

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- And from more malicious "mistakes"?
  - Infinite thread creation
  - Storage jamming with files

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- And from *System.exit(whatever)*?

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- And from more malicious "mistakes"?
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  - Storage jamming with files
- And from *System.exit(whatever)*?
- Scalability issues

User's code's assessment

Chosen solution

- Delegate the execution to workers

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- Pros:
  - Allow to run code without impacting webPLM's performances
  - Meet the scalability requirements

User's code's assessment

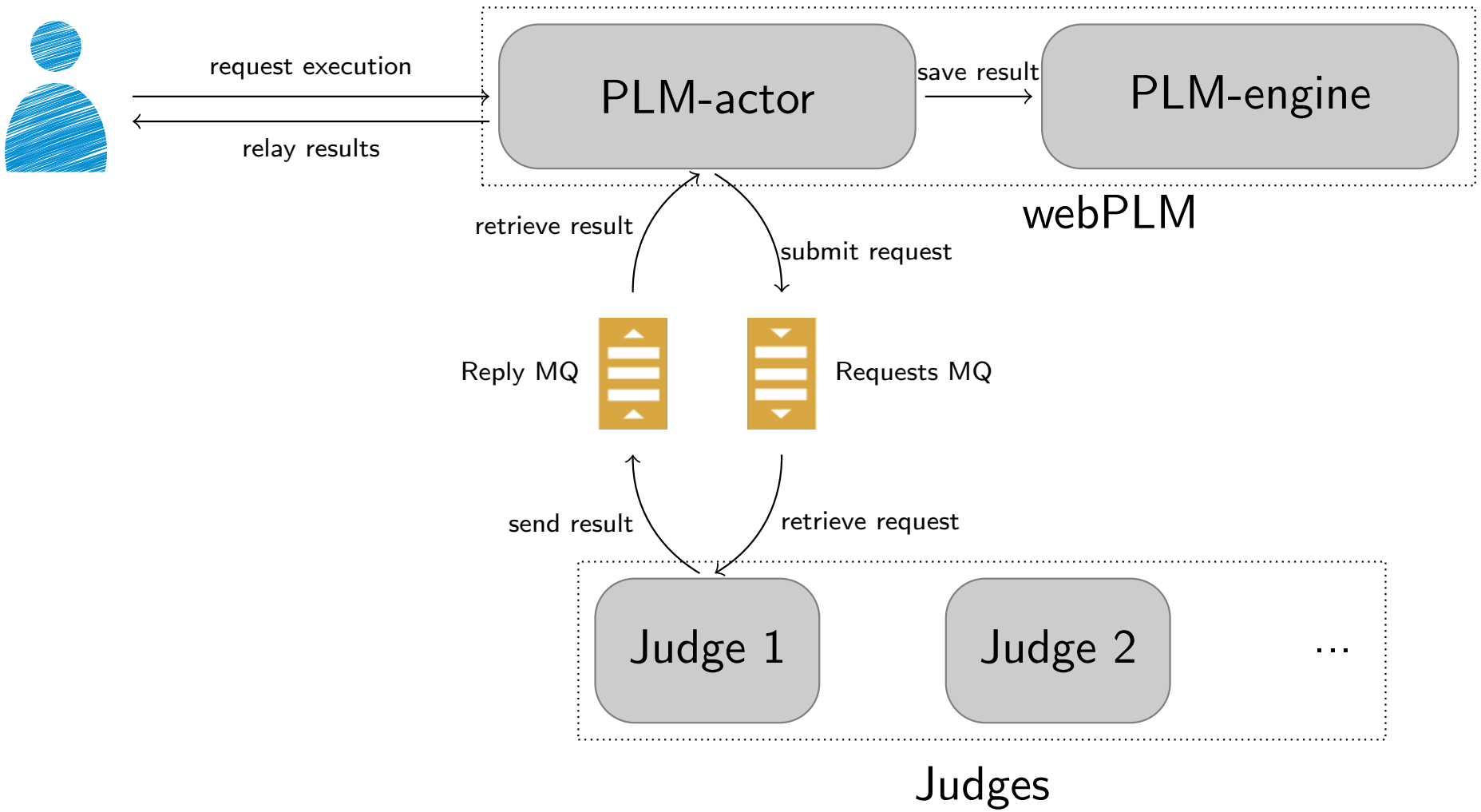
Chosen solution

- Delegate the execution to workers
- *Let it crash* strategy

- Pros:
  - Allow to run code without impacting webPLM's performances
  - Meet the scalability requirements
- Cons:
  - Need to deploy them easily
  - Should be able to reset them
  - Have to restrict their resources usage

User's code's assessment

Architecture with judges



User's code's assessment

Docker

- Build image of your application
- Run containers based on images
- Lightweight virtualization

User's code's assessment

Example of Dockerfile

User's code's assessment

Docker-compose

User's code's assessment

Docker in our case

- Deploy easily all components
- Restart judges automatically
- Hold out against users' mischiefs

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Result

Current architecture

Result

Live-session in TELECOM Nancy

- 30 hours of live testing with 100 students.

Result

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- Engine is (almost) working fine...

Result

Live-session in TELECOM Nancy

- 30 hours of live testing with 100 students.
- Engine is (almost) working fine...
- ... but user experience needs to be improved!

Result

Live-session in TELECOM Nancy

- Can't cope with the workload.

Result

Live-session in TELECOM Nancy

- Can't cope with the workload.
- No tools for monitoring set up...

Result

Live-session in TELECOM Nancy

- Can't cope with the workload.
- No tools for monitoring set up...
- ... so the bottleneck is unknown.

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Next steps

Refactor the code

- Rushed to release a stable version before September...
- Needed to refactor some parts of the code.
- Standardized behavior of local and server mode.

Next steps

Simplify workflow to adapt the content

- Store most content inside PLM.
- Heavy and error prone workflow.
- Need to extract the content from PLM's jar.
- Allow to implement an exercise editor.

Next steps

Solve performance issues

- Set up some monitoring tools.
- Perform some load testing to identify the bottleneck.

Questions

Thanks for your attention, any questions?